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animals appear to the common observer, yet a description of their minute anatomy alone would form many a chapter of surpassing interest to those who delight in contemplating the perfection of God's works.

In our next paper we shall commence the description of the different species of land snails to be found in New England.

EXPLANATION OF PLATE 1.

- Fig. 1. Magnified view of superior tentacle of a snail. *op.* optic nerve; *e.* eye; *o.* olfactory nerves.
 Fig. 2. *Helix albolabris*, with shell removed and mantle thrown back, showing lung and heart. *m.* mouth; *h.* heart.
 Fig. 3. One row of teeth from the same, magnified.
 Fig. 4. A portion of one row of teeth from the same, highly magnified.
 Fig. 5. Side view of teeth of the same.
 Fig. 6. Entire tongue of same, enlarged.
 Fig. 7. Jaw of same, magnified.
 Fig. 8. Nerve centres of *Helix albolabris*.
 Fig. 9. Shell of *Helix albolabris*.
 Fig. 10. *Helix albolabris* crawling.
 Fig. 11. " " turned back, showing orifice to lung, *a.*
 Fig. 12. Lung and heart of Garden Slug, *Limax flavus*.
 Fig. 13. Slug suspended from twig.

THE VOLCANO OF KILAUEA, HAWAIIAN
ISLANDS, IN 1864-65.

PLATE 2.

BY W. T. BRIGHAM.

Soon after one o'clock we came upon the brink of the great crater. From below us steam and vapor rose in a sluggish column, but we saw no fire and heard no noise: the conflagration had, as it were, left nothing but smoking ruins to mark the scene of its triumph. The deep plain before us was surrounded with steep rock-walls, from

three to seven hundred feet high, and nearly nine miles in circuit. Boston could easily be accommodated within this crater, and Vesuvius would not much more than fill it. The whole circuit of the walls is much broken and interrupted, and we rode along over several large cracks, one of which opened about a year since (in 1863). Some are concentric, and others radial, and all along the edges of the abyss are fumaroles from which issue clouds of steam, not as at the Geysers of California, with great noise, but gently as a quiet respectable teakettle pours out its vaporous offering. The steam had no smell of sulphur, and ferns were growing luxuriantly over the openings, while the condensing vapor formed pools of sweet water, the only source of drinking water in this fire-searched region.

When we reached the north-western part of the crater, we found on our left a ridge of reddish earth, from which steam and strong sulphurous fumes poured in many places. This was the western Sulphur Bank, and in its cracks were forming the most beautifully delicate crystals of sulphur, almost mosslike; and here and there a blue crystal of sulphate of copper, and greenish masses of sulphate of iron. The earth, which is formed by the decomposition of the lava, was quite hot, and we found some natives cooking fern stalks in the steam.

While we were examining the sulphur deposits, our men came up with our blankets, and we at once engaged an old kanaka who lived near by, to guide us down into the crater. Two other kanakas went with us to carry water and bring back specimens. The descent was at first quite steep, down the hard grey walls; and then the path wound along on broken shelves, under a grand precipice two or three hundred feet high, quite perpendicular, and

looking as if built of regular blocks of stone. Small shrubs grew by the way, and we picked berries (*vaccinium*) in abundance. At last after a rapid descent on a steep gravelly bank, we stepped into the fresh black lava of the crater floor. This floor looked quite smooth and level from above, but we found it was very rough and uneven. The fresh lava we first met had broken up during the last winter and overflowed all the end of Kilauea, and it was piled in twisted masses and broken slabs and bubbles. Its surface was covered with a thin nitrous crust, which crumbled beneath our tread, sounding as hard-frozen snow does on a frosty morning, and thus a distinct path had been worn to Lua Pélé or the great fire-pit which is at the south-western end of the crater proper.

Half a mile of such travelling and we came to a wall of hard trachyte, quite unlike the lava of the floor, which seems to have been floated up here from the walls below. The great blocks which compose it are said to change their position from time to time as the floor rises and cracks. Fissures of all sizes were common, and from many of them steam issued changing the black lava to a reddish hue. The action of vapors and gases had produced fragments of all shades and colors, some so metallic as to closely resemble gold, others red, violet, green, etc. Now and then we broke through the thin crust of a bubble, and although we could not repress a momentary shudder as we thought of what might be the result of a fall into the regions beneath, the stirring interest of the place drove away considerations of personal danger.

After two miles we came to a fearful crack about three or four feet wide, and so deep we could not see the bottom, but still there was no sound that we did not make ourselves, and we could not see any fire. I was certainly

disappointed in this, for I remembered the accounts of those who had seen all this plain in a melted state. As we came near the Lua Pélé, however, we found a black cone some twenty-five feet high, with a bright spot at its summit. There was fire at last, but we pushed on over the loose slabs, and through the steam, until suddenly we stood on the brink of the lake of lava some seven hundred feet long, five or six hundred feet wide, and perhaps thirty feet below us. The surface was covered with a dark crust, broken around the edges where the thick blood-like mass surged against its banks with a dull sullen roar. The sulphurous vapors which rose from its surface were blown away by the wind, so that we could approach the very brink on the windward side, but the heat was so great that we had to hold our hands before our faces. The walls on which we stood and where we intended to sleep, were thickly covered with Pélé's hair* which we saw constantly forming. The drops of lava spattered out as the waves dash against the walls, drawing after them a thread, or two drops spin out a thread between them like the finest "spun glass," and these broken threads are caught against the rough points of the cliffs and form a thick coating.

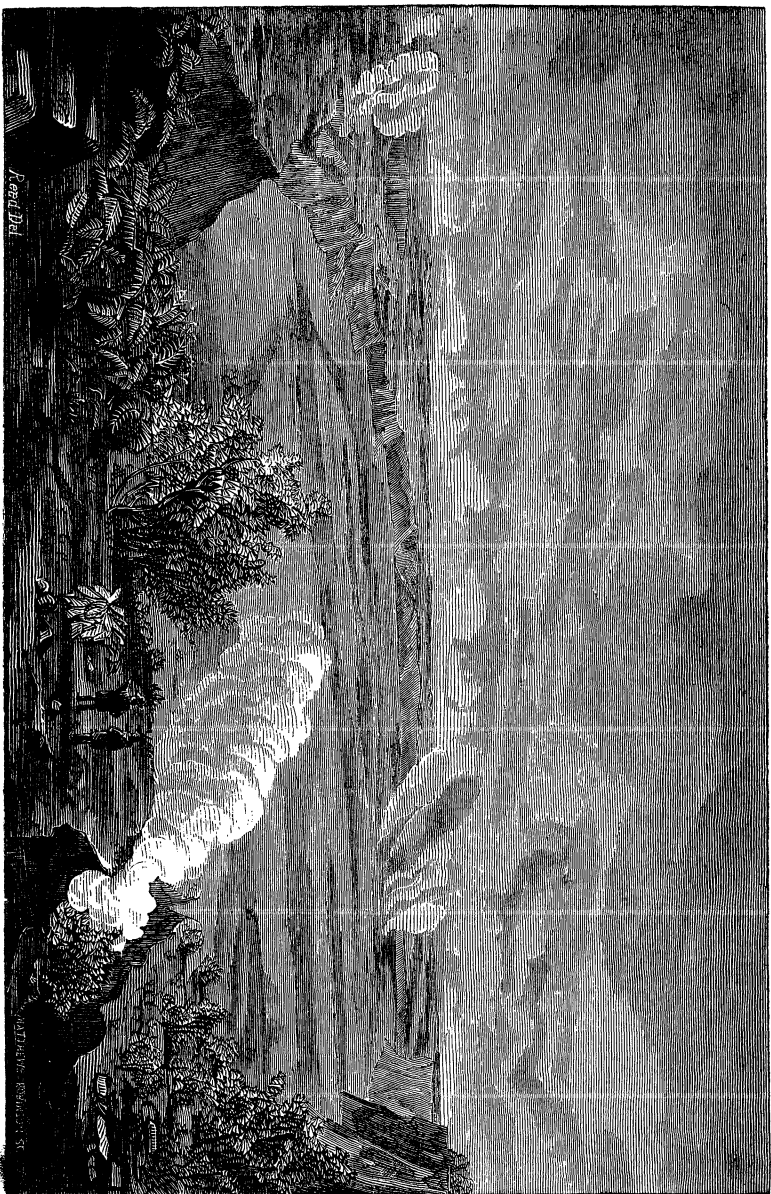
Occasionally a crack would open in the surface of the lake, and the white-hot lava boil up through it in several places for a few minutes, and then turning red, and cooling rapidly, become black as before. A current would often set in towards the banks, and cake after cake breaking off from the crust be drawn in, causing a violent bubbling and spattering; and then this would cease, or run in another direction, but always from the centre to the edge.

As it grew dark we were very tired, having travelled

*Pélé was the Hawaiian Goddess of fire whose home was in Kilauea.

since six o'clock in the morning, and hoping to wake up in the night when the fires would be more brilliant, we rolled ourselves up in our blankets, and, with our guides near by, went to sleep a few rods from the crater. At nine o'clock I waked, and as the night air was quite cold, moved to the very edge of the crater to warm myself, and enjoy the magnificent fireworks. The moon was up and almost full, but her light was dull beside the fires of Pélé. Finding the place quite comfortable, I picked out a soft rock for a pillow, and went to sleep again. At twelve I awaked with a start and found myself in a shower of fiery drops, some of which were burning my blanket. I shook myself and jumped back, looking at my watch to note the time, and then stood gazing at the strange scene some time before I thought of my companions. The whole surface of the lake had risen several feet, and was violently boiling and dashing against the banks, throwing the white-hot spray some sixty feet over the upper banks, causing the providential rain that awakened me to see this grand display. There was no thundering or bellowing, only the splash of the waves as they fell back, or the rattling of the cooled drops on the upper banks. The light was so intense as to be almost painful, as the crust had wholly melted, and brilliant fountains of fire covered the surface.

When I could think of anything else, I called the others, but only succeeded in awakening the guides, and just then a drop of lava came plump into a greasy newspaper we brought our supper in, and it blazed up suddenly, to the dismay of our guides, who, thinking that the volcano had broken out at our feet, at once fled to a safe distance. Failing to arouse them with my voice, I threw several handfuls of gravel at the sleepers but without effect, and I had to climb down, almost blinded by gazing at the fire,



BRIGHAM ON THE CRATER OF KILAUEA IN 1864-5.

and shake them roughly. When they at last reached the edge the action had greatly diminished, and in a few minutes more the dark crust covered the central portion, extending rapidly to the sides, and after watching the last crack close, we all went to sleep again. I was glad to see such distinct flames, as their existence has been denied in volcanoes. They were bluish-green, and shot up in tongues or wide sheets a foot long.

In the morning we found it very misty, and the mist soon turned to rain. We went to the cone we had seen the night before, and climbing its spattered sides, looked into the hole in the top. We could see that it was white-hot within, but we were unable to excite it, although we threw in pieces of scoria, and poked it with our sticks. On the other side of the path was a cone, long and irregular, with many pinnacles from which much smoke issued. We got quite wet in climbing up the bank, and at seven o'clock were eating our breakfast in the grass house on the upper ledge.

A year afterwards I again went to Kilauea. Many changes had taken place. Lua Pélé was much larger, and two new pools had opened during the winter. The place where I slept last August had melted away, and I was obliged to camp in another place. The superstitions of the natives have always been greatly excited while in this crater, and I saw many reasons for it. As we walked towards the bright lake about dusk, I thought I saw two or three men walking to and fro on the brink, and asked my guide what strangers had been down into the crater. "Aole haole aka akua paha"! (It is no stranger but perhaps a spirit) said the old man, so solemnly that I was startled. As the steam moved in the wind, it opened and brought to view the black cliffs beyond, and this we had taken for

moving men, not reflecting that the forms must have been gigantic at such a distance from us. In ancient times the bodies of the chiefs who worshipped Pélé were committed to this pit.

As we were sitting on the brink, a shrill shriek broke through the night air. We could see the black walls of the crater all around us, and between us and the pathway leading out, a line of watchfires, and I was quite as much impressed as my natives with the direful stories they had been telling me. The shriek was repeated, and it was evidently the utterance of a human being in great agony. Lighting the lantern we had brought for any emergency, we went slowly towards the place, until the shriek was uttered at our very feet. We hastily examined the cracks and called, but there was no answer, and all was still. We looked everywhere, finding no one, and turned to go back, thinking some poor kanaka, venturing down in the dark, had fallen into some crack, and at last died.

We had gone but a few rods when the shriek was repeated. The natives clung to me in mortal terror, but I insisted on going back, and placing the lantern on a rock, we sat down to await developments; it seemed as though the question, "are there any spirits present?" was quite superfluous. We sat more than five minutes in silence, and I could feel the poor fellows tremble as they sat close up to me. Then the shriek was repeated, but we saw the spirit that made it,—a jet of steam—and my boys were encouraged.

The smaller lakes were close to the surface, and I could put my stick into the melted mass. It was strange to see how soon the lava cooled on the surface. As soon as it had ceased bubbling, I threw a small perfectly dry stick of wood into it, and it was more than fifteen minutes before it smoked much.

This last visit was in August, 1865, and ever since that time the action in the crater has been increasing, until the floor of this vast pit has risen nearly a hundred feet, and at times has been quite inaccessible, owing to the streams of lava flowing over the surface.

THE FOSSIL REPTILES OF NEW JERSEY.

BY PROF. E. D. COPE.

In traversing New Jersey from north west to south east, we pass over rocks and soils which have been deposited by an ocean whose coast has constantly moved toward the south east, until its position has become that now forming the boundaries of the State. Hence the material now nearest the coast is that last laid down, and as we proceed towards the north west, the beds are a sediment of successively older and older date. Not, however, till we reach the red sandstone of the line of New Brunswick, do we meet with formations which have suffered a sufficient amount of pressure and heating to convert them into stone to any great extent. The gradual recession of the ocean has been occasioned by a similarly regular elevation of the land in its rear. This elevation was however, only gradual during portions of the time; between such elevations existed long periods of rest. For instance the red sandstone mentioned before was for a very long time within the shore of the ancient ocean. During that time beds were deposited outside of an older coast land, which subsiding later, were covered by newer beds, which include the remains of those creatures that have died near the